REMARKS

Introduction

The present Amendment is in response to the Examiner's Office Action mailed February 27, 2004. Claims 1-47 are pending. Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

Rejections Under 35 U.S.C. § 102

The Office Action rejected claim 1 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,456,417 (Maywar), or U.S. Patent No. 6,658,035 (Mason), or U.S. Patent No. 6,211,983 (Shiragaki). Anticipation requires that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ.2d 1051, 1053 (Fed. Cir. 1987). The following discussion illustrates that neither Maywar, Mason, or Shiragaki anticipate claim 1. The elements of claim 1 are not found in the cited references nor are the elements found in the cited references as set forth as in claim 1.

Claim 1 is a method for converting an input optical signal from a first wavelength to a second wavelength using a lasing semiconductor optical amplifier (LSOA). The LSOA comprises an input, a laser cavity with an optical path, an amplifying path connected to the input and passing through the laser cavity, and a laser output. Claim 1 further requires propagating the input optical signal along the amplifying path of the LSOA. Then, claim 1 requires outputting from the laser output of the LSOA an optical signal based on the input optical signal. The output

signal is in response to the input optical signal propagating along the amplifying path. In other words, the laser output follows the input signal to the amplifying path.

In claim 1, there is a clear distinction between the amplifying path and the laser output. The distinction between the amplifying path and the laser output is clearly shown in multiple Figures and described in the specification. However, the laser output and the amplifying path are both related to the same laser cavity and the amplifying path passes through the laser cavity. For instance, Figure 3 illustrates one example of the amplifying path 130 and the laser signal 116. In Figure 3, laser signal 116 is based on the input signal on the amplifying path 130.

In other words, a LSOA is both a laser and a semiconductor optical amplifier and the laser output is distinct from any signal being amplified. The LSOA and the semiconductor optical amplifier share the same laser cavity.

Mason does not Anticipate Claim 1

Mason teaches a tunable laser source with integrated optical amplifier. Even though the laser of Mason integrates a laser and an optical amplifier, the optical amplifier is external to the laser cavity. Mason specifically teaches for example, that "the laser assembly 100 comprises an integration of a laser and an optical amplifier, with the optical amplifier located external to the laser cavity." *See* col. 3, lines 5-7. Mason further states that "the amplifier 90 is external to the resonant cavity of laser 180 formed by mirrors 120 and 150." *See* col. 3, lines 34-36. Although Mason indicates that at least a portion of the laser and of the optical amplifier share a common waveguide, Mason states that "the amplifier is positioned outside of the laser resonator cavity to receive and adjust an output received from the laser." *See* col. 2, lines 19-23.

According to Mason, the amplifier amplifies the output of the laser. The common waveguide for the laser and the optical amplifier enables the output from the laser to be directly

coupled into the amplifier. *See* col. 3, lines 30-33. The laser output is therefore input into the amplifier. In claim 1, the input optical signal propagates along the amplifying path of the LSOA. The amplifying path passes through the laser cavity. Claim 1 then requires outputting an output optical signal from the laser output of the LSOA based on the input optical signal.

In other words, the laser output of Mason comes first and is then amplified whereas the output optical signal at the laser output in claim 1 is in response to the input optical signal propagating on the amplifying path. Further, the laser cavity of claim 1 is for both the laser output and the amplifying path, whereas Mason clearly teaches an amplifier external to the laser.

In addition, the wavelength of the amplified output appears to be the same as the laser output in Mason. The tunability of Mason appears to be related to techniques for forming optically active and passive sections and their junctions using selected area regrowth. *See* col. 4, lines 8-25. Mason does not teach or suggest that the wavelength of the laser is converted to another wavelength by the amplifier. Mason teaches instead that the laser output is amplified by the optical amplifier whereas Claim 1 requires "outputting from the laser output . . . an output optical signal . . . having the second wavelength."

The output optical signal of the LSOA is not amplified in claim 1 while the laser output of Mason is amplified by the external optical amplifier. Further, Mason does not suggest that the output of the laser has a wavelength that is different from the amplified output of the laser. Claim 1, in contrast, outputs an output optical signal having a second wavelength. For at least these reasons, claim 1 is not anticipated by Mason.

Maywar does not Anticipate Claim 1

In Maywar, the holding laser, along with a set and reset signal, are each input to a semiconductor optical amplifier. *See* Fig. 2. These three inputs are also evident in Figure 1

(Input control signal IC in Figure 1 corresponds to the set and reset signals of Figure 2). Maywar teaches that the input control signal IC (which includes the set and reset signal) is coupled in a polarization maintaining 50;/50 coupler with a holding laser beam. . . . The combined beam is applied to the DFB SOA. *See* col. 4, lines 6-11. In other words, the semiconductor optical amplifier taught by Maywar requires 3 distinct inputs (set signal, reset signal, and holding beam) to generate the output signal with a new wavelength.

The need for 3 distinct inputs in Maywar is related to the need to vary the hysteresis of the semiconductor optical amplifier SOA. In other words, the set signal and the reset signal are needed to change the gain of the SOA and cause the output signal to go between its higher and lower levels. *See* col. 4, lls. 40-60. In Maywar, Figure 1 appears to illustrate that output of the SOA is in the same path as the input, whereas the output optical signal and the input optical signal in claim 1 are distinct signals.

In claim 1, the LSOA is pumped to exceed a lasing threshold and the output optical signal having the second wavelength is output based only on the input signal. As previously stated, the output optical signal is distinct from the input optical signal and the output optical signal of claim 1 is not on the amplifying path. The gain of the LSOA in claim 1 is not changed to vary a hysteresis of the LSOA as taught by Maywar. As a result, Maywar does not teach or suggest pumping the laser cavity of the LSOA to exceed a lasing threshold for the laser cavity. Maywar further does not teach or suggest outputting from the laser output of the LSOA an output optical signal based on the input signal and having the second wavelength. For at least these reasons, Maywar does not anticipate or teach claim 1.

Shiragaki does not Anticipate Claim 1

The Office Action next suggests that claim 1 is anticipated by Shiragaki. In particular, the Examiner references columns 1-3 and paragraphs 8-10, 15, and 16. Figure 1 of Shiragaki relates to a convention optical signal converting apparatus. However, the device of Figure 1 separates the input optical signal into first and second separated optical signals. *See* col. 6, lines 60-65. The semiconductor optical amplifier then "produces, as the amplified optical signal, a combination of the first separated optical signal having the input wavelength and the optical signal having the oscillation wavelength . . . ." *See* col. 8, lines 12-15. This output is then filtered. *See* col. 8, lines 12-20.

In Shiragaki, the output of the laser is input, along with another signal, into the semiconductor optical amplifier. In claim 1, the input optical signal is input to the input of the LSOA and then, in response to the input signal propagating along the amplifying path, outputting from the laser output of the LSOA an output optical signal. More particularly, the laser output of claim 1 is not input into an optical amplifier as taught by Shiragaki.

The optical signal converting apparatus of Figure 6 in Shiragaki illustrates a similar scenario. In Figure 6, the laser output and optical signal are input to an optical coupler, combined, and then input into a semiconductor optical amplifier. More specifically, the optical coupler 434 optically couples the input optical signal and the oscillation optical signal to produce a coupled optical signal. *See* col. 15, lines 18-14. The couples optical signal is input to the semiconductor optical amplifier, which produces a gain and optical amplifies the coupled optical signal into an amplified optical signal. *See* col 15, lines 17-36. The amplified optical signal from the semiconductor optical amplifier is then input to a variable wavelength optical filter. *See* col. 15, lines 40-50.

The elements of claim 1 require that the input optical signal propagating on the be distinct from the laser output. Claim one does not require, as is taught by the cited references including Shiragaki, that the laser output be input to the optical amplifier. This is evident because the input optical signal is distinct from the laser output, whereas in the cited references, the laser output is the signal being amplified by the semiconductor optical amplifiers.

Further, the laser output of Shiragaki is combined with another optical signal before being input to the laser. Claim 1 only requires an input optical signal to an amplifying path of the LSOA. The input optical signal is not combined with another signal. For at least these reasons, claim 1 is not taught or suggested by Mason, Maywar, or Shiragaki and withdrawal of the rejection is respectfully requested.

Claim Rejections under 35 U.S.C. § 103

Claims 1-47 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Maywar, or Mason, or Shiragaki. For at least the reasons discussed above, none of Maywar, Mason, or Shiragaki alone or in combination disclose the invention set forth in claim 1. As discussed above, none of the cited references make a distinction between the amplifying path and the laser output. None of the cited references teach outputting an output optical signal from the laser output based on the input signal. In other words, the laser output of claim 1 follows the input signal to the amplifying path of the LSOA. In contrast, each reference teaches inputting the laser output into an optical amplifier.

As a result, each reference teaches away from the present invention by teaching that the laser output is input into an optical amplifier. In other words, the cited references teach that the laser output comes before the amplifier. In claim 1, the input optical signal propagating along

the amplifying path of the LSOA has an effect on the laser output. In each reference (Mason, Maywar, and Shiragaki), applying the output of the amplifier to the laser would be nonsensical because the purpose of the amplifier in those references is to amplify the laser output. As a result, none of the references teach or suggest claim 1.

Claim 1 is believed to be in condition for allowance for at least this reason. Claims 2-13 depend from claim 1 and overcome the cited reference for at least this reason.

The Office Action admits that these references do not disclose the use of plural LSOAs as set forth in claims 14-47, or the specific type of LSOA and paths taken. Because of this admission and the reasons set forth above, claims 14-47 are not taught or suggested by Maywar, or Mason, or Shiragaki and withdrawal of the rejection under § 103 is respectfully requested.

Conclusion

In light of the arguments set forth above, Applicants earnestly believe that they are entitled to a letters patent, and respectfully solicit the Examiner to expedite prosecution of this patent application to issuance. Applicant notes that Should the Examiner have any questions, the Examiner is encouraged to telephone the undersigned.

Respectfully submitted,

Date: 8/19/04

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